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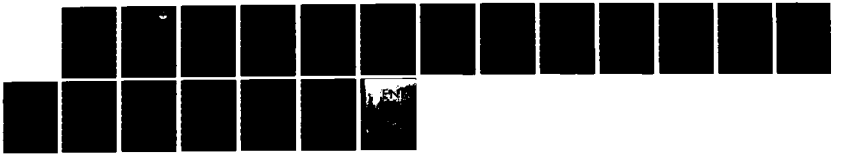

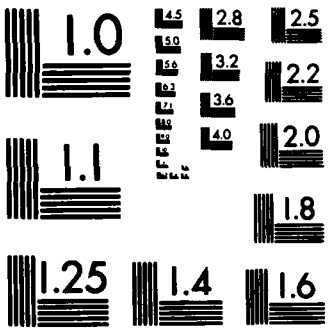

USAF OEHL REPORT
83-191EQ020EWA

WATER QUALITY MANAGEMENT SURVEY

BLYTHEVILLE AFB, ARKANSAS

MAY 1983

USAF Occupational and Environmental Health Laboratory
Aerospace Medical Division (AFSC)
Brooks Air Force Base, Texas 78235

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William E Mabson

WILLIAM E. MABSON, Colonel, USAF, BSC
Commander

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The USAF OEHL conducted an on site water quality management survey at Blytheville AFB from 11-14 April 1983 at the request of HQ SAC/SGPB. Main areas of interest were (1) the wastewater treatment plant effluent fecal coliform count, and residual chlorine content, and (2) the stream sampling protocol. The drinking water plant, landfill and industrial shops were also included in the survey. Results of the survey indicated that the low residual

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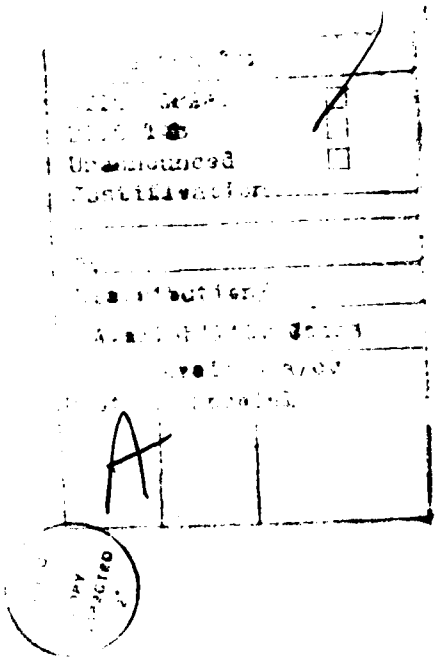
ITEM 20 (continued)

chlorine content cau ed high fecal coliform co nts in the wastewater effluent. The chemical parameters sampled in the stream monitoring program did not coincide with the requirements of the State of Arkansas and required modification. Recommendations were made to increase the residual chlorine content of the wastewater effluent and to increase the mixing of the chlorine contact chamber. A list of the chemical parameters was included in the report for stream monitoring.



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USAF OCCUPATIONAL AND ENVIRONMENTAL

HEALTH LABORATORY

Brooks AFB, Texas 78235

Water Quality Management Survey

Blytheville AFB, Arkansas

May 1983

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I. INTRODUCTION

HQ SAC/SGPB requested the USAF Occupational and Environmental Health Laboratory (USAF OEHL) to conduct an on-site water quality management survey of Blytheville AFB. The authors visited the base and conducted the survey during the period 11-14 April 1983.

Specific areas of interest were the wastewater treatment plant and the stream sampling program. In addition, the drinking water plant, the base landfill site, and the industrial shop areas were visited. Environmental monitoring programs and monitoring data were reviewed.

II. WATER QUALITY MANAGEMENT SYSTEM

A. Drinking Water

Drinking water at Blytheville AFB is supplied by a base operated treatment plant, and serves an effective population of approximately 5500. The water supply comes from two wells that have a total production capacity of 2000 gallons per minute (GPM). The results of an analysis of the base water supply are shown in Table 1.

Treatment of the water consists of aeration, coagulation with lime, sedimentation, filtration and chlorination. The plant is designed for 1.5 million gallons per day (MGD). The average flow through the plant is 0.5 MGD. Treated water is initially stored in a 200,000 gallon covered reservoir. The water is then distributed to two elevated storage tanks, one 200,000 gallons, the other 300,000 gallons. Both tanks are cathodically protected.

Monitoring of the drinking water quality is done by the base bioenvironmental engineering section of the hospital. Parameters monitored include fecal coliform, residual chlorine, fluoride, pH, and chemical analysis. The plant operator also maintains records of residual chlorine, pH, iron, and fluoride. The concentration of fluorine and chlorine average 0.5 and 1.0 mg/L, respectively.

B. Wastewater

Wastewater effluents from Blytheville AFB are treated on base at a sewage plant providing secondary treatment. Industrial wastes are combined with the domestic wastes for treatment. They originate from oil/water separators, photo lab rinse water, battery shop waste and NDI developer fluids. Battery acids are neutralized before being flushed to the sanitary sewer.

TABLE 1

Chemical Analysis of Water Supply Wells

19 Feb 83

CONSTITUENT	EAST WELL	WEST WELL
pH	6.0	6.0
Temperature(°C)	25	24.5
Nitrate (mg/L)	0.1	0.1
Orthophosphate (mg/L)	0.23	0.23
Organophosphorous (mg/L)	0.07	0.01
Polyphosphate (mg/L)	0.01	0.01
Phenol (µg/L)	10	98
Alkalinity, Total (mg/L $CaCO_3$)	78	80
Carbon Dioxide (mg/L)	130	160
Chloride (mg/L)	1.0	1.0
Total Dissolved Solids (mg/L)	108	109
Silica, Dissolved (mg/L)	11.2	11.2
Specific Conductance (µmhos)	155	155
Endrin (µg/L)	0.02	0.02
Lindane (µg/L)	0.01	0.01
Methoxychlor (µg/L)	0.2	0.2
Toxaphene (µg/L)	1.0	1.0
2,4-D (µg/L)	0.06	0.06
2,4,5-TP Silvex (µg/L)	0.06	0.06

The secondary wastewater treatment system consists of:

1. Grit chamber
2. Comminutor/bar screen
3. Primary clarification (3 tanks)
4. Trickling filter
5. Rotating biological contactors (RBC, 2 disk system)
6. Secondary clarification (3 tanks)
7. Chlorination
8. Anaerobic digestion

After the waste sludges are digested and dried, they are disposed of in a landfill adjacent to the plant (Figure 1). The plant has recycle capability through a dosing chamber which maintains a constant flow through the plant during low demand periods. The plant is designed for a flow of 1.5 MGD. The average flow through the plant is 0.514 MGD, and has a maximum rate of 1.82 MGD.

There are four septic tanks on base that treat domestic wastes at remote sites. The sites are the golf shop, Alert facility, Missile Maintenance Squadron, and the Jet Engine Test Cell.

The bioenvironmental engineering section monitors the plant effluent where it empties into the Pemiscot Bayou. Parameters monitored include fecal coliform and chlorine residual. Plant operators monitor the effluent in accordance with their National Pollutant Discharge Elimination System (NPDES) permit requirements (Table 2).

C. Storm Drainage

Runoff from the main base area and part of the flight line discharges into Ditch 25, which borders the west side of the base. Runoff from the Alert facility discharges to Pemiscot Bayou. When deicing fluid is in use, runoff is pumped to two ponds adjacent to the Alert facility.

The base bioenvironmental engineering section monitors discharges at representative sites around the base (see Figure 1). The Pemiscot Bayou is monitored at a point above the golf course discharge point to establish a background reading. Pemiscot Bayou and Ditch 25 are both monitored at sites where they exit the base. Sites 001 and 002 are monitored only when there is flow.

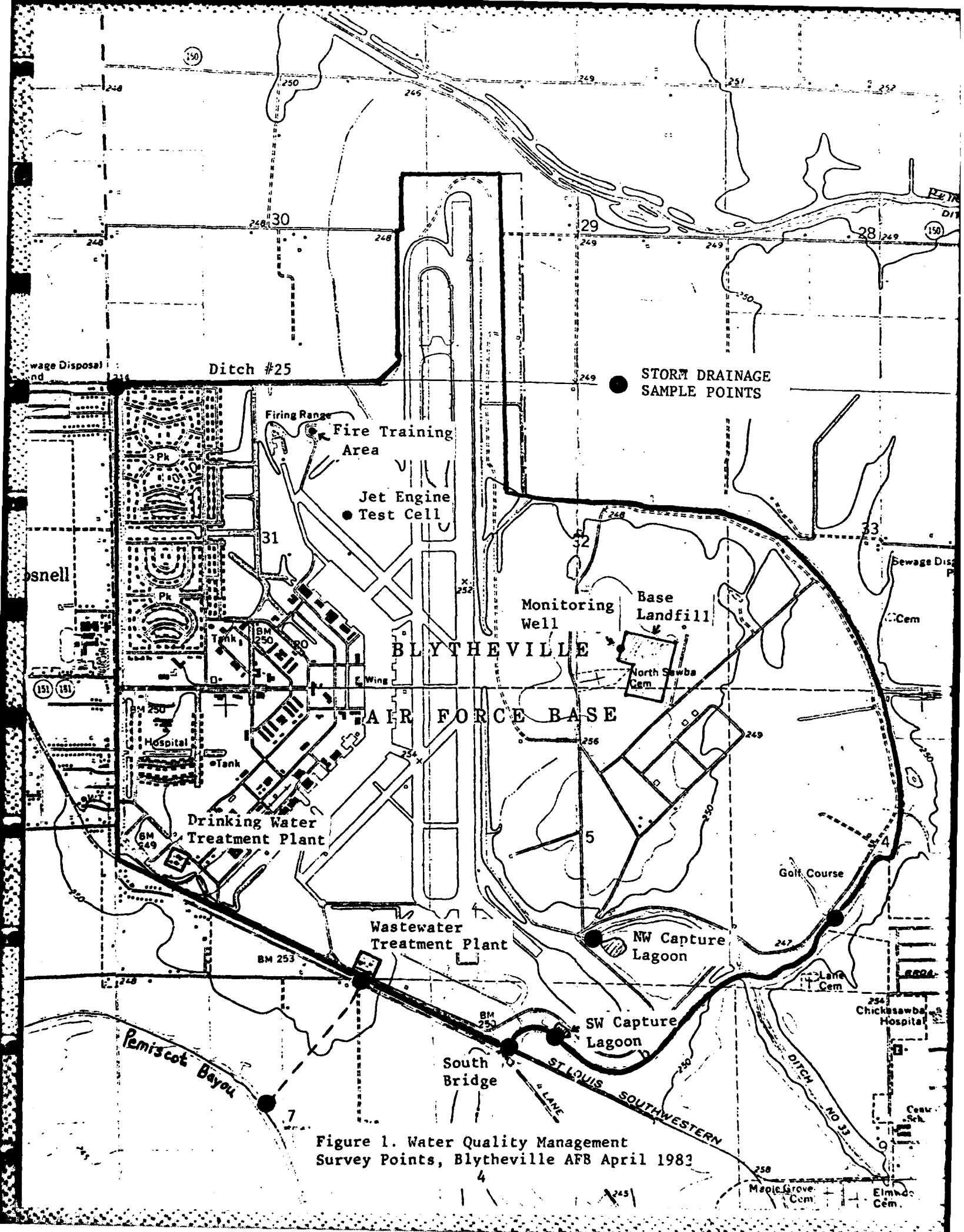

Figure 1. Water Quality Management Survey Points, Blytheville AFB April 1983

TABLE 2

National Pollutant Discharge Elimination System Effluent Limitations

for the Sewage Treatment Plant*

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITS Averages		MONITORING REQUIREMENTS	
	30 Day	7 Day	Frequency	Sample Type
Flow (MGD)	0.865	2.163	Daily	Totalizer
Biochemical Oxygen Demand (5-Day, mg/L)	10	15	Weekly	Composite
Total Suspended Solids (mg/L)	15	25	Weekly	Composite
Fecal Coliform (No./100 mL)	200	400	Weekly	Grab
pH	---- 6-9 ----		Weekly	In Situ
Floating Solids	-----No Discharge Except Trace Amounts------			

*Samples shall be taken at Outfall 001 immediately following the last treatment unit.

D. Solid and Hazardous Waste Disposal

Refuse Disposal

Solid wastes generated at Blytheville AFB are disposed of at a landfill located in the NE quadrant of the base. The landfill operator monitors the depth to the groundwater. The minimum depth to the water table has been 15 feet. The depth of the refuse cells has been kept to a maximum of 12 feet.

The City of Blytheville is authorized to dispose of their solid waste at the base landfill. There are no contaminant monitoring wells around the landfill.

Hazardous Waste

Blytheville AFB has been designated as a small quantity generator by the Arkansas Dept of Pollution Control and Ecology; therefore, no hazardous waste permits are required. The primary sources of hazardous waste are POLs, PD-680, photographic solutions, and zyglo. The POL wastes are used in fire

training exercises. The Defense Property Disposal Office (DPDO) receives the PD-680 and zyglo for disposal. Developing solutions at the base photo shop are processed on site for silver recovery. The remaining solutions are disposed of in the sanitary line.

E. Base Directives

The base bioenvironmental engineering section had prepared OIs that were excellent. Topics of interest for this survey included OIs on spills, sample collection, chemical and bacterioloical analysis of water, and stream pollution monitoring.

III. OBSERVATIONS AND FINDINGS

A. Drinking Water

1. The raw water maximum contaminant level (MCL) for phenol was exceeded in the West Well (Table 1). At that concentration it is possible for taste and odor problems to develop in the water supply.

2. Fluoride was added with chlorine before sand filtration at the drinking water plant. This could account for the difference in readings between the plant operators and the bioenvironmental engineering section personnel. Filtration can account for losses of between 0.1 and 0.3 mg/L. Fluoride was found to be 0.5 mg/L by the bioenvironmental engineer and 0.8 to 1.0 mg/L by the plant operator.

3. The technique for determining fecal coliforms requires upgrading. A review of past data indicated that a different dilution series may provide more consistent results. Dilutions should be such that the plate develops between 20 and 60 colonies. The water bath in use could not be kept within the temperature range required for the tests.

4. The Environmental Health Services personnel indicated that the La Motte kit used for determining fluoride concentrations was not very accurate. The test used visual comparison of color.

5. The screens on the reservoir had holes in them which could allow birds and insects to enter the covered area and contaminate the water supply.

B. Wastewater

1. The overall operation of the wastewater treatment plant was good. The plant was meeting stringent effluent requirements.

2. The chlorination chamber provided sufficient theoretical contact time, however, the mixing provided was inadequate. The possibility of adding baffles to the tank were discussed with the plant operators.

3. The chlorine content of the effluent from the wastewater plant averaged 0.3 mg/L. This low value was believed to be the cause of high fecal coliform counts reported by the bioenvironmental engineer.

4. The NPDES requirement for fecal coliform was more stringent than required by the State for a Class B stream. The possibility of modifying the requirement was discussed with bioenvironmental engineering personnel and the environmental coordinator.

5. The plant operators reported that the trickling filter could not be flooded because the walls were too weak. Because of this, problems were encountered with filter flies (psychoda) and clogging of the filter. Alternative methods of controlling these problems were discussed with the plant operators.

6. The anaerobic digestors were operated by controlling solids content and pH. These parameters are not good indicators of the dynamic changes that the system can undergo; the digestor may be souring and the pH and solids will still indicate normal conditions.

C. Storm Drainage

The monitoring sites for the base drainage system were adequate. However, the chemicals monitored do not reflect the type of contaminants that may be present, nor the chemicals for which the State has established discharge limits.

D. Solid and Hazardous Waste Disposal

1. Waste POLs from the Jet Engine Test Cell were not contained properly. The wastes were being flushed to an apron and could easily migrate to the groundwater over extended periods of use.

2. The Fire Training site did not have a barrier between it and the adjacent ditch to prevent migration of POLs to the surface and groundwater.

3. The base allows the City of Blytheville to use the base landfill. There was some uncertainty as to whether the landfill operators were monitoring the wastes deposited as to the compatibility for landfill disposal.

4. Waste acids from the battery shop were disposed of to the sanitary sewer line. The acid was improperly neutralized; caustic soda was sprinkled into the drain and the the acid was added. This method does not provide sufficient neutralization.

5. The POL storage area had the proper containment in case of a spill.

E. Base Directives

1. The OI on "Oil and Hazardous Substances Spill" included sampling technique but not preservation techniques. This topic was covered in other OIs but should be repeated for convienence in this OI.

2. The OI on "Collection and Analysis of Sewage Effluent Samples" required minor changes to reflect the proper procedure for coliform analysis.

3. The OI on "Stream Pollution Monitoring" was very good. Sample collection and preservation techniques were well covered. However, the chemicals monitored did not coincide with the State moniotoring requirements.

4. The OI on "Potable Water Quality Surveys" included the sewage effluent as a sampling point.

5. The OI on "Chemical Analysis of Supply Drinking Water" required updating for compounds monitored. The Total Trihalomethane (TTHM) concentration had been analyzed and was below the MCL level of 0.1 mg/L. The maximum TTHM potential had not been determined for their water supply system.

IV. RECOMMENDATIONS AND CONCLUSIONS

A. Drinking Water

1. The fluoride content of the drinking water in the distribution system should be increased by fluoridating after the filtration process. There would also be a cost savings in that fluoride will not be removed by the filter. Chlorination would also have to occur after filtration as recommended by AFR 161-44, Attachment 2.

2. We recommend a dilution series of 10, 35 and 100 for the fecal coliform analyses to ensure growth of the proper number of colonies for statistically significant counting. In addition, a thermometer calibrated to 0.2°C is needed for the incubation chamber.

3. The Table of Allowances, TA 906, authorizes the Drell Kit for laboratory analyses by the bioenvironmental engineering section. This method uses a spectrophotometer and will provide more accurate and repeatable results for a variety of compounds.

4. The screens on the reservoir should be replaced to reduce the possibility of contamination.

5. The bioenvironmental engineering section should determine the maximum TTHM potential for the system as specified in AFR 161-44, para 6-6.

B. Wastewater

1. The mixing in the chlorination tank may be improved by installing baffles so that the flow goes over and then under the baffles. For that size reactor three more baffles would be sufficient. In addition, the chlorine concentration should be increased to at least 1.5 mg/L to reduce the fecal coliform count in the effluent.

2. The trickling filter media should be hosed and subjected to chlorination to provide relief from filter flies and clogging problems.

3. The operational parameter used for anaerobic digestors should be the volatile acids to alkalinity ratio. This ratio should be between 0.1 and 0.25 for best results. If these limits are exceeded then the recycle rate, solids content, temperature or pH may be adjusted to correct the problem before souring occurs.

C. Storm Drainage

Table 3 lists the chemicals that should be monitored in the stream sampling program. These were taken from the Arkansas Dept of Pollution Control and Ecology publication "Regulation Establishing Water Quality Standards for Surface Waters for the State of Arkansas." The monitoring should be done on a semiannual basis. If after repeated analysis a chemical does not exceed its MCL that chemical may be deleted from future analyses. If there are process changes, then the chemical should be monitored again to be certain it is not present.

D. Solid and Hazardous Waste Disposal

1. The Fire Training site and the Jet Engine Test Cell both require a containment system for waste fuels. The Fire Training site requires only a curb around the area. The Jet Engine Test Cell requires a curb and a storage tank, or possibly an oil/water separator.

2. We recommend that a monitoring program be initiated at the base landfill to characterize and document the City of Blytheville's refuse delivered to the site.

3. Waste battery acids should be added to a holding tank, diluted, then neutralized with sodium bicarbonate (baking soda) to a pH of approximately 6-8. This neutralized solution can be disposed of in the sanitary sewer line.

E. Base Directives

1. In all OIs, where sample collection is discussed, a section on sample preservation should also be included.

TABLE 3

Master List for Stream Monitoring

CHEMICAL CHARACTERISTIC		STANDARD	
Chemical Oxygen Demand (mg/L)		NA	
Oil & Grease (mg/L)		NA	
*Phosphorous, Total (µg/L)		100	
*Chloride (mg/L)		20	
*Sulfate (mg/L)		30	
Turbidity (NTU)		50	
pH		6-9	
Dissolved Oxygen (mg/L)		5	
*Radioactiviy (Gross Beta pc/L)		1000	
Bacteria (Fecal Coliform No./100 mL; 30 Day Avg, 7 Day Avg)		1000, 2000	
Total Dissolved Solids (mg/L)		380	
		24 hr avg	at any time
*PCBs	(µg/L)	0.014	NA
*Aldrin	(µg/L)	3.0	NA
*Dieldrin	(µg/L)	0.0019	2.5
*DDT & Metabolites	(µg/L)	0.0010	1.1
*Endrin	(µg/L)	0.0023	0.18
*Toxaphene	(µg/L)	0.013	1.6
*Chlordane	(µg/L)	0.0043	2.4

*May be discontinued if repeated analyses show the concentration is less than the MCL.

2. Changes to the OI on "Collection and Analysis of Sewage Effluent Samples" include adding the following: (1) rinsing the fecal coliform sample with three 20 mL volumes of buffered water after filtration, and (2) sterilizing the forceps with methanol and then flaming.

3. The chemicals monitored in the OI on "Stream Pollution Monitoring" should be changed to include those chemicals listed in Table 3 (see recommendation C).

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